The Workshop.

A Monthly Journal, devoted to Progress of the Useful Arts.

EDITED BY

I. SCHNORR AND OTHERS.

VOL. IV. No. 5.

THE DEVELOPMENT OF HELIOGRAPHY, AS A BRANCH OF ART-INDUSTRY.*

By Ludwig Pfau.

Thus we have seen that the several attempts to produce a sun-picture from which impressions can be taken are divided into three groups in heliography, by etching, reaction and casting. Let us consider each separately. So early as 1825 Nicephorus Niepce had obtained photogenic printing plates by the help of asphalte, but in a very imperfect style. In 1853 his nephew, Niepce de St. Victor resumed his uncle's experiments, and improved on the original process. With benzine and oil of lemons he gave to the asphalte the necessary fluidity and covered his metal plate with the mixture. Then after exposure to the light behind a positive *cliché*, it was placed in a bath of naphtha and benzine, which separated the parts not affected by the sun light, and exposed the naked metal to the view. In the case of a photograph from nature the plate was lightly sprinkled with resin-powder as in aquatinta and then engraved by means of an acid. This process can show a number of clever reproductions of sketches and drawings, but the copies from nature have to be retouched by a copperplate engraver, if any useful impressions are to be taken.

In copies from nature Charles Nègre is the only artist who has succeeded in obtaining perfectly satisfactory results from the application of asphalte. He makes use of the coating of asphalte not as etching-ground or *reserve* against the acid, but only as a transitory means of protection, in order to gild by the galvanic process those parts of his steel plates which are not to be subjected to the etching process. At the same time, by the help of chemical reaction the whole asphalte layer is dispersed into a net-work of small crevices which are at once filled in with the precipitate of gold. In this way there results on the protected places a delicate net-work of gold, which in printing acts as the grain of the printing-surface. When the gilding is finished the asphalte is removed by ether, and a damascened plate obtained on which the parts that are gilt represent the white, while the unprotected places only are affected and indented by the acid. In this way Nègre executed heliographic engravings which are admirable both for their size and perfection. A series of architectural views of the Cathedral of Chartres, among which are portals of nearly two feet and a half in height, are the very best that have as yet been produced of this kind. The vermicular texture of the printing-surface gives to the picture the ununiform accidental appearance of manual work. Up to the present time however Nègre has neither attracted disciples to his method, nor given any wide publicity to his process; it is therefore probable that his delicate mode of engraving renders the hand of a master an indispensable necessity, and is not adapted for universal industrial application.

For the reproduction of drawings and engravings the asphalte process of Amand Durand has been brought into greater use. His improvement on Niepce's method consists principally in the perfection of the material, in the preparation for obtaining greater exactness and in greater ease in etching. He succeeded in making this process of practical and commercial utility, and to him, beyond all other heliographers, are art and trade indebted for the greatest number of plates. Among them are to be found some most excellently executed reproductions of engravings and drawings of ancient and

* Concluded from p. 51 *ante*.

modern masters, and his heliographic transformation of copperplate engravings into typographic plates deserves especial mention. We will here only cite a Judgement of Solomon from Raffaelle, by Anderloni, an engraving eighteen inches high, the typographical copy of which answers every expectation, and a considerable number of typographical reductions from Schnorr's Illustrated Bible for French and English editions, and lastly an interesting copy of two of Doré's woodcuts magnified to four times their size.

But notwithstanding the success of Nègre in copies from nature, and of Durand in reproductions, asphalte is not to be held out as likely to play any important part in the future of heliography. For copies from nature it is too unmanageable; for reproductions of engravings and drawings it certainly shows more consistency for etching than gelatine; but the latter admits of several more delicate processes which dispense with the etching process, and is used in all the methods of which we have now to speak.

So early as the year 1839 the photochemical effect of chromic acid on organic glutinous and mucilaginous substances was discovered by Mungo Ponton in England, and applied to photographic experiments, and when, in 1853 the asphalte was again taken up in France, Fox Talbot, an Englishman, the real originator of photographs on paper attempted to apply chrome-gelatine to heliographic purposes. He prepared a mixture of one part gelatine, twenty parts water, four parts bichromate of potash in saturated solution, with which he covered his metal plate. After due exposure to light he provided it with an aquatinta substratum of finely powdered copal-gum and then subjected it to the action of perchloride of iron. The acid penetrated the gelatine, most quickly where the places were not acted on by the light, the others more slowly according to its action upon them, and thus gradually corroded the metal in proportion to the shadows. It is easy to understand that a greater delicacy is thus obtained than by asphalte, which must be quite removed from the dark places and retained on the light, so that the lights and shades are too abrupt. Fox Talbot himself indeed produced no very delicately toned specimens, but the sensitive and exact gradation of photochemical reaction which the new substance brought to light is a sure prelude to greater things.

In fact Garnier has also obtained excellent results from this process; his *Château de Maintenon*, a rather large architectural view with a landscape was the most admired heliographic work of the Exposition of 1867 and received the great prize. This picture, in regard to its execution, cannot be distinguished from an aquatinta engraving, and has a delicacy of shading and a clearness of detail which no photograph has ever surpassed. Garnier prepares his sensitive layer with a soft syropy substance of vegetable origin imbued with chromic acid, and sprinkles it after exposure to light with resin-powder. As the light passes through a negative on which the shaded parts are transparent and the lights not, the dark parts become coherent under the influence of the light, and only take up a little of the powder, while the bright parts untouched by the light remain hygrometrical and retain the resin in full. The half-tones are covered in proportion to their gradation of shades. When the resin is fixed by the heating of the plate it forms the reserve for the etching, and at the same time the grain for the impression. This process is decidedly rational; for while the development of the picture and the preparation of the printing surface are effected by one and the same operation, the gradation of tints produces by itself the thicker or thinner structure of the hatching or dotting. Apparently however it is not altogether free from some difficulties, nor is the same perfect result always to be attained. Still Garnier has produced some typographic specimens which answer every expectation on tinted pictures from the printing press.

A peculiar chromic process which for exactness and rapidity of execution surpasses all other etching methods has been successfully treated by E. Baldus, a German established in Paris. He covers his plate of copper with no organic layer, but brings the acids, the base of which is chrome and ammonia, into immediate contact with the metal, as with the iodising of silver in the Daguerreotype, in order to render it directly sensitive. The plate, exposed to the light while still wet, is dried by it on the uncovered places, and changed and corroded by the chemical process connected with it. The acid is then washed away and the prepared plate rolled with a light varnish which attacks only the places which are more or less spared by the light; those on the contrary where the photochemical action has decomposed the copper reject the fatty substance. The coat of varnish now serves for a reserve for the etching. As here no strange substance intervenes between the picture and the metal surface, the grain is produced chemically by the corroding action of the light. These pictures of Baldus hold a middle place between aquatintas and lithographs. Several works of sculpture are most delicately copied by his process, and as to the reproduction of engravings, he has published among other works a beautiful collection of ornaments after the best masters in a hundred sheets, besides some very successful specimens of transformations of copperplate into typography.

As copperplate engraving is the typical basis of the above named processes, so the second heliographical group rests on the principle of lithography. The first imperfect experiments in this direction were made in the year 1854 by Paul Pretsch, an Austrian, established in England. But it was Poitevin who first obtained a firm footing for the reaction process, and who, when he had fully perfected his method, sold the secret of it to Lemercier, the proprietor of the great lithographic establishment at Paris. The process is sure and simple. The stone is covered with a thin layer of bichromatised albumen or gelatine and exposed, the light passing through the negative which it is desired to copy. After due exposure the whole surface is equally blackened. The stone is then treated like an ordinary lithograph, being washed in oil of turpentine damped with water, the color rolled

in and pressed. The heliographic picture comes out under the roller just as in lithography from the naked stone. The result is here still more surprising than in the ordinary lithograph in which the drawing is at all events to be seen on the stone before the washing, but it is easily to be understood. The chromate of gelatine acts simply as the gum which protects the stone from the fatty substance; but the light decomposes the chrome-gelatine so that it loses its hygroscopic, grease-rejecting quality, and the parts exposed to the light, penetrated by the varnish, now act as a lithographic drawing. As to the artistic rendering through this process it is most satisfactory. The heliographic lithograph has the appearance of a delicate and carefully executed chalk drawing with some approach to an Indian-ink picture, a result attributable to the greater fineness of the grain. The half-tones are full and the shades clear. Of the specimens we have seen we cite two large door tympanums of Notre Dame Cathedral at Paris with plastic figures; several from the portals of the Cathedral at Amiens, which are remarkable for numerous figures; the view of the beautiful romanesque church of St. Michael at Dijon, etc. All these pictures display the hand of an artist. An antique female head, large as life, from a cast, is excellent, and a shield of Henri II reduced to one fourth the original size; a piece of elegant armour in embossed workmanship from the Louvre is admirable in every respect. The reproduction of drawings and engravings produces also favorable results, and for copying archæological documents and facsimiles photolithography is peculiarly adapted.

We pass over the several processes which depend on the transfer to the stone, as the direct influence of the light on the stone obtains the best results, and turn to the method which originated with Tessié du Motay and Maréchal in Metz, called by them Phototype. The inventors take off their impressions not from a stone or metal plate, but from the gelatine itself. For this purpose they prepare a compound of isinglass, gelatine and gum, to which they add a chromate, strengthened by sulphites or phosphates and lay it evenly on a smooth plate of copper. The plate after exposure to light is immersed during a moderately long time in water, then dried and treated as a lithographic stone. The grain, which is here not present, is replaced by the water, which at every successive washing penetrates into the pores of the parts which are not acted on by the light, and removes the greasy matter, while the parts which are acted on retain the printing ink in proportion as the light has rendered them impervious to the water. The results of this method are admirable. Among all hitherto obtained they approach the nearest to the effect of the photographic sun-picture and do not yield to it in perfection of tone. The half-tones are particularly full and perfect. It may easily however be imagined that the gelatine plate does not allow many copies, as the successive baths soon soften it, so that the delicate tones are lost. The process adopted by Albert of Munich differs from the foregoing only in his using glass instead of copper for his plate, and a thin sheet of gelatine instead of a thick one by which means the process is rendered easier, though on the other hand the softening is also more rapid. For copies from nature this method of printing will therefore never come into extensive use for commercial purposes; it may however be advantageously employed for the reproduction of certain drawings, especially of bold and rough indian ink sketches.

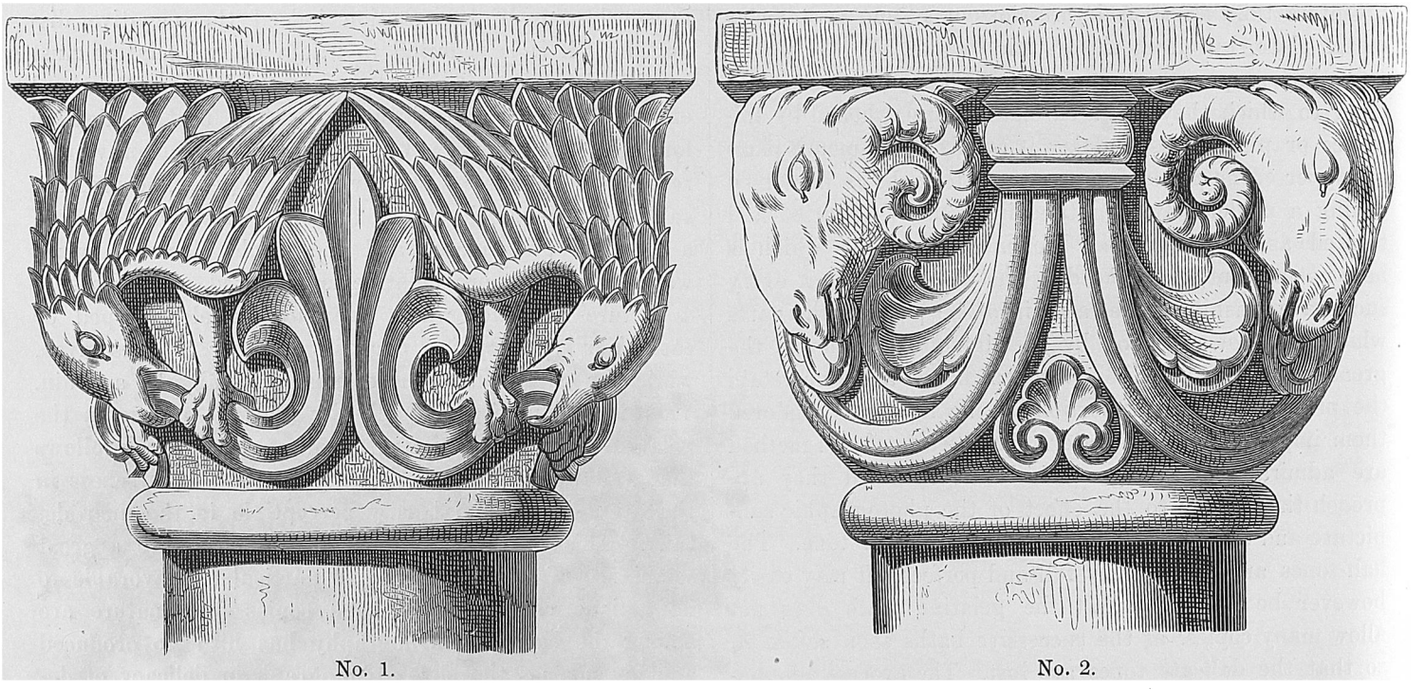
The third group of heliographic methods, that which rests on the production of a cast or hard gelatine model, is not the least interesting one. The light not only changes the sheet of gelatine on its surface, but penetrates, according to the degree of its intensity, to a greater or less depth, and the proportion of light and shade comes out with such mathematical precision in the impression that the picture is changed into a perfect model in low relief. After exposure to light, the tissue is merely immersed in water, in order to give a proportional expansion to the parts which are not at all, or but little acted on by the light, and to obtain a relieved picture; when immersed for a longer time in the liquid, thereby dissolving and washing away the less illuminated parts, a sunk mould remains. The solution produces a sharper modelling, but then the process of solution must be applied on the unexposed reverse of the tissue, else the half-tones which have become insoluble on the surface will be undermined and washed away by the water. The relief so obtained is then only to be cast in metal in order to obtain a printing plate.

The inventor of this method was the before mentioned Paul Pretsch, but the most remarkable results from it have been obtained by Emile Placet. He spreads the sheet of gelatine simply on the collodium of the negative by which the illumination of the one side and the washing away on the other are produced simultaneously. In this operation indeed the negative disappears. If it is required to retain it, the gelatine must be placed on a transparent and insoluble substratum and exposed to the light through it. The best application for this purpose is a thin sheet of gelatine previously rendered insoluble by chrome-alum. After exposure, the substratum is fixed, by means of a waterproof glue on a metal or glass-plate, and the whole placed in warm water until no more gelatine is dissolved. The result is a picture in relief which can now be electrotyped or cast. For typographical purposes a higher relief is given, while for copperplate there must naturally be a grain. This is produced chemically by Placet's process in the gelatine itself and has a vermicular texture which follows the gradations of tone, showing a certain coarseness in the deep shades and hardly perceptible in the finer details. This alternation imparts to the picture a great semblance of fac-similes and is particularly favorable to its artistic character. Placet's copies from nature are among the best that heliography has hitherto produced and far surpass the silver photograph in delicacy of detail. Many of his architectural views especially are full of harmony and perfect in their effect.

W. Woodbury, an Englishman, has succeeded in obtaining a happy combination of the qualities of gelatine with a mechanical law for heliographic purposes. He first produces a hard gelatine model by Placet's method, then places the relieved picture under a polished plate of lead, and reproduces, by means of hydrostatic pressure, the exact counterpart of the gelatine mould in the metal. With the plate so obtained he prints off with the aid of a special press and a gelatine ink. The hydrostatic pressure leaves the relief so unimpaired that if necessary the same mould can produce a dozen or more such metallic plates in fac-simile. The printing press itself is of very simple construction; consisting of a crucible which can be raised or lowered by a screw and a cover which folds over it. The color is indian ink or any other semi-transparent pigment with an addition of warm thin liquid gelatine. Of this mixture, a sufficient qantity is poured on the middle of the plate, and a leaf of paper placed over it; the cover of the press is then shut down, squeezing out the superfluous pigment, and allowing the gelatine-ink to coagulate for about the space of thirty to sixty seconds according to the degree of temperature. The cover is now raised and the paper withdrawn, the congealed color adheres to it and forms a relief corresponding to the sunk mould, which however as it contains much more water than gelatine disappears altogether in the drying process, and leaves a perfectly flat drawing. The picture, when dried, is fixed by means of alum. In this way no grain is needed for the printing plate, and the problem is solved of an impression which, like an indian ink drawing, produces the shades or tones simply through a greater or less application of the pigment. Impressions finished in this manner approach the nearest to silver photography and when treated in a suitable manner with this view, are not to be distinguished from the impressions with metal pigments. The practical advantages of the method are obvious. Already have they been laid hold of by the trade, for the well known Paris firm of Goupil & Co., has adopted the process and erected extensive premises for profiting by it. The commercial importance which heliography has already attained may easily be appreciated by such an undertaking.

On the whole, such has been the result of the successful experiments on the several processes, that heliography has made its way; and if its commercial extension has here and there met with some obstacles, the cause is not to be sought in the impractibility of the theory, but in the infancy of the practical application. But the difficulties of the introduction, which every new discovery has to surmount, will be soon overcome by that longer and more general practice which technical traditions always produce.

SPECIMENS OF ORNAMENTATION.



No. 1. No. 2.

Nos. 1 and 2. German. Twelfth century. Romanesque Capitals in Schwarzrheindorf Church near Bonn.